



Monthly Webex Tag-up, 9 April 2015

Agenda

- 1. Announcements and opportunities***
- 2. Science Team Meeting***
- 3. Data Archival and Data Products***
- 4. Recent Data Analysis***



Fall AGU 2015 Session Proposals (Deadline: 22 April)

We are looking to organize two sessions to provide a venue for DISCOVER-AQ/FRAPPE results.

As in the past, we expect abstracts to be distributed across more than just these two sessions.

Air Quality Research: From Emissions to Impacts

***Conveners: Gabi Pfister, Patrick Reddy, Greg Frost,
and Annmarie Carlton (TBD)***

Air Quality and Remote Sensing

***Conveners: Jim Szykman, Shobha Kondragunta, Caroline Nowlan,
and John Sullivan***

If there are other ideas for sessions that would include DISCOVER-AQ/FRAPPE interests, please let us know.



ACT-America Post-Doc Opportunity

One or more postdoctoral positions are available in the study of the fluxes and transport of greenhouse gases. The positions will focus on analyses of airborne measurements intended to quantify and reduce uncertainty in atmospheric inversions caused by atmospheric transport, and improve quantification of regional-scale CO₂ and CH₄ emissions. The successful candidates will analyze aircraft data with an ensemble numerical modeling system incorporating uncertainties in both atmospheric transport and greenhouse gas fluxes and boundary conditions. The work will contribute to the Atmospheric Carbon and Transport – America (ACT-America) study, a 5-year, NASA-funded Earth Venture Suborbital mission led by Profs. Kenneth Davis and Thomas Lauvaux. Research flights are scheduled to begin in the winter of 2016.

The successful candidates should have a strong background in one or more of the following areas: numerical weather modeling and data assimilation, statistics, inverse methods, carbon cycle science, boundary layer meteorology and aircraft data analyses. Strong communications skills, and a Ph.D. in atmospheric sciences or a related field are required.

The initial appointments are for one year, with strong potential for continued support. The positions are available beginning July 2015, and will remain open until filled. The salaries will be commensurate with experience, and will comply with Pennsylvania State University guidelines.

To apply, please upload a current CV, a cover letter, the names and addresses of three references, and a brief statement of research interests and long-term goals. Applications received by 27 April will receive full consideration.

Penn State is an equal opportunity, affirmative action employer, and is committed to providing employment opportunities to minorities, women, veterans, disabled individuals, and other protected groups.

To apply, please visit: <https://psu.jobs/job/56732>



ACT-America Research Associate Opportunity

One or more research associate positions are available in the study of the fluxes and transport of greenhouse gases. The positions will focus on analyses of airborne measurements intended to quantify and reduce uncertainty in atmospheric inversions caused by atmospheric transport, and improve quantification of regional-scale CO₂ and CH₄ emissions. The successful candidates will analyze aircraft data with an ensemble numerical modeling system incorporating uncertainties in both atmospheric transport and greenhouse gas fluxes and boundary conditions. The work will contribute to the Atmospheric Carbon and Transport – America (ACT-America) study, a 5-year, NASA-funded Earth Venture Suborbital mission led by Profs. Kenneth Davis and Thomas Lauvaux. Research flights are scheduled to begin in the Winter of 2016.

The successful candidates should have a strong background in one or more of the following areas: numerical weather modeling and data assimilation, statistics, inverse methods, carbon cycle science, boundary layer meteorology and aircraft data analyses. Strong communications skills, a Ph.D. in atmospheric sciences or a related field, and at least 2 years of postdoctoral research experience are required. The ability to contribute to research and data management, and to assist project graduate students and postdoctoral fellows is beneficial.

This is a fixed-term appointment for one year from date of hire with strong potential for continued support. The positions are available beginning July 2015, and will remain open until filled. The salaries will be commensurate with experience, and will comply with The Pennsylvania State University guidelines.

To apply, please upload a current CV, a cover letter, the names and addresses of three references, and a brief statement of research interests and long-term goals. Applications received by April 27, 2015 will receive full consideration.

Penn State is an equal opportunity, affirmative action employer, and is committed to providing employment opportunities to minorities, women, veterans, disabled individuals, and other protected groups.

To apply, please visit: <https://psu.jobs/job/56743>

Special Features

Elementa welcomes proposals for Special Features, a set of related articles addressing themes or projects of broad interest, typically 4–10 articles in each group, usually including a synthesizing Commentary. Special Features may fall within a single knowledge domain or be cross-listed under two or more domains; in either case, a single Editor-in-Chief will be responsible for the entire Special Feature.

Publishing a Special Feature with *Elementa* provides a unique opportunity for a team of authors to present research that addresses a specific theme or that derives from a joint project. Whether your research falls into a single discipline, or multiple knowledge domains, *Elementa*'s rigorous promotion of Special Features will reach a wide variety of fellow researchers, policy-makers, and the interested public worldwide.



Submission Requirements

- **Title:** Each Special Feature should have a title of no more than 150 characters.
- **Guest Editor or principal investigator:** In some cases, the peer-review process will be managed by the principal investigator proposing the Special Feature, acting as Guest Editor in place of an *Elementa* Associate Editor. (Guest Editors will be asked to comply with *Elementa*'s [Guidelines for Guest Editors](#).) In other cases, the Editor-in-Chief may appoint an independent Guest Editor, or have his or her Associate Editors manage the review process.
- **Special Feature components:** When proposing a Special Feature, we will need you to provide us with the following information:
 - The knowledge domain or domains that the Special Feature would fall within;
 - List of articles expected, including article type, title, and contact information for each corresponding author;
 - Deadline for submission of articles within the Special Feature, generally no more than six months from acceptance of the Special Feature proposal.
- **Summarizing Commentary:** The Guest Editor (or principal investigator) may, if he or she chooses, submit a Commentary summarizing the Special Feature, situating the articles comprising it in a coherent context. Such Commentaries are formal articles, subject to review.

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Spotlight

Patricia L. Yager Explains the Significance of the ASPIRE Special Feature

December 10, 2014



New Special Feature

Biogeochemical Exchange Processes at Sea-Ice Interfaces (BEPsII)

Invitation for a FRAPPE/DISCOVER-AQ Special Feature in Elementa

- Six Knowledge Domains, all hosted by major US universities (Dartmouth, Univ. Michigan, Georgia Tech., Univ. Washington, Univ. of Colorado)
- Atmospheric Science Domain hosted by CU Boulder (Detlev Helmig Editor-in-Chief)
- Elementa will set up dedicated website with listing of papers and ancillary information
- Non-profit peer-reviewed journal
- Low, discounted flat rate publication fee (~\$1,200 for special feature articles)
- All open access
- No page limit
- Well recognized by public, media, and policy makers
- Experienced Associate Editor Board; can appoint Special Feature Guest Editor



Science Team Meeting Update

The room block reserved for the meeting is now full.

The agenda was distributed earlier this week. Comments?

We have had four more submissions/reminders since the agenda was distributed, so the agenda will be adjusted again before the meeting. Don't assume that Friday will be a slow day!

***Please send any new requests to Mary Kleb
(Mary.M.Kleb@nasa.gov)***



Final Data Status for Colorado

P-3B data is now complete

C-130 data is expected to be complete by this Friday

We have delayed public release, but expect it to finally happen early next week

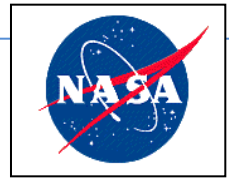
Our first priority next week will be a new C-130 merge. Expect it by the end of the week.

The P-3B merge will also need to be updated for the flight on 2 August

If there are other priority requests for value added products, please let us know. (Binned profiles and column densities for the P-3B spirals are already available for California and Houston)

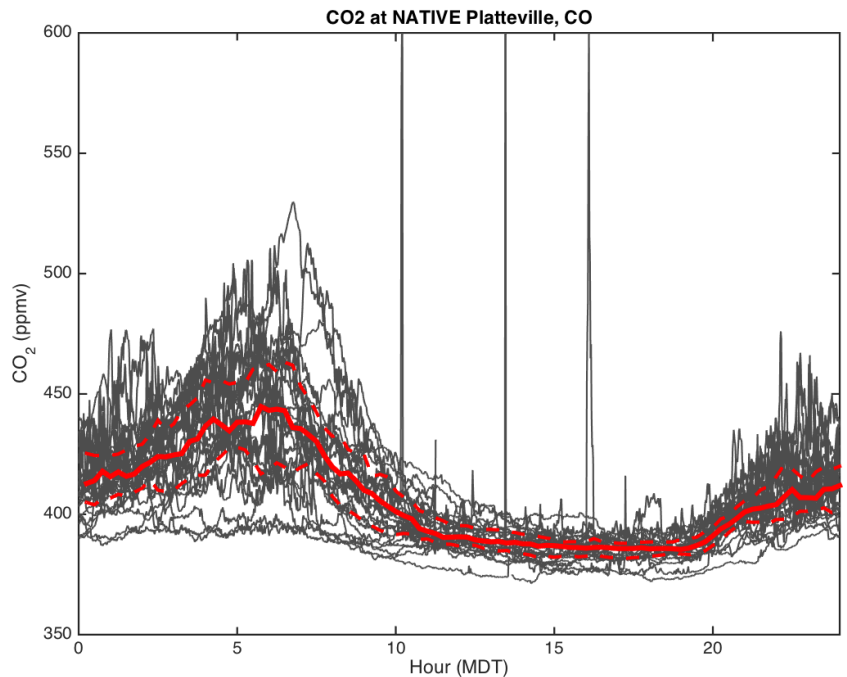
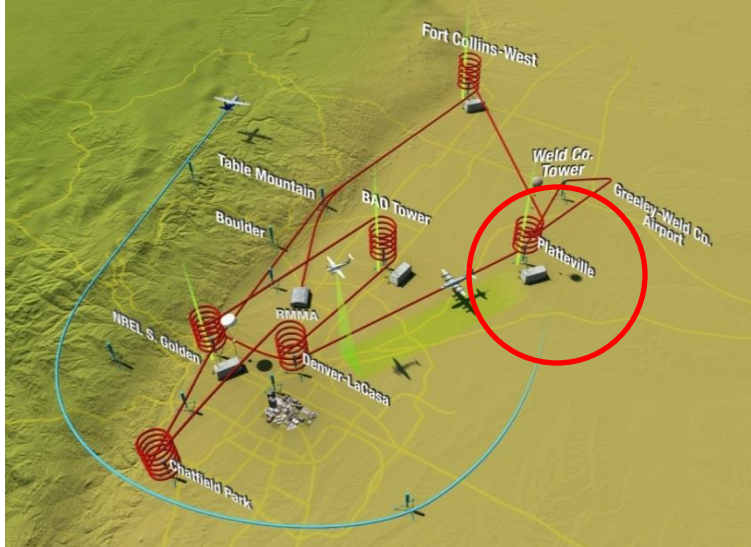
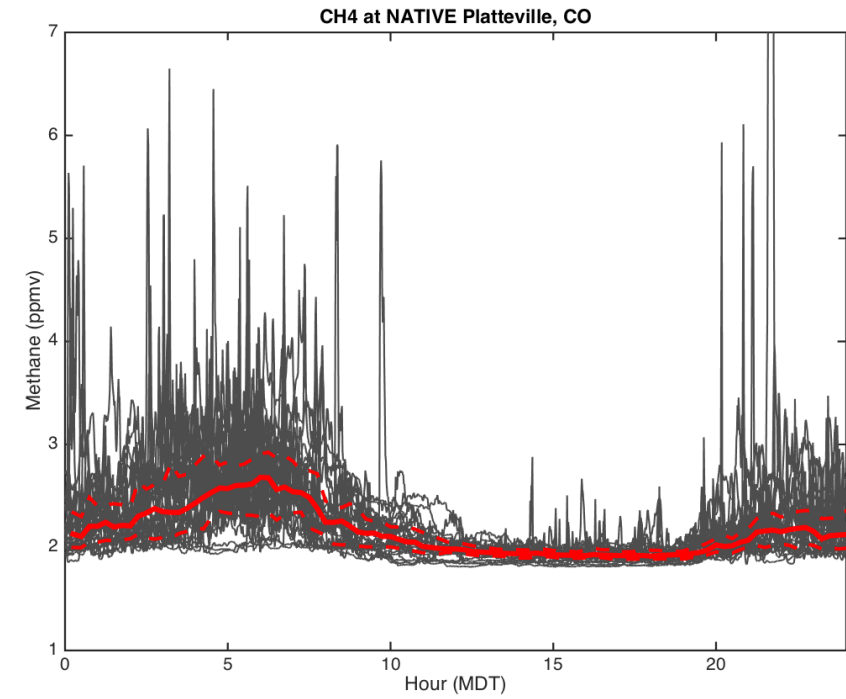


DISCOVER-AQ ANALYSES FROM GSFC/PSU NATIVE TEAM*



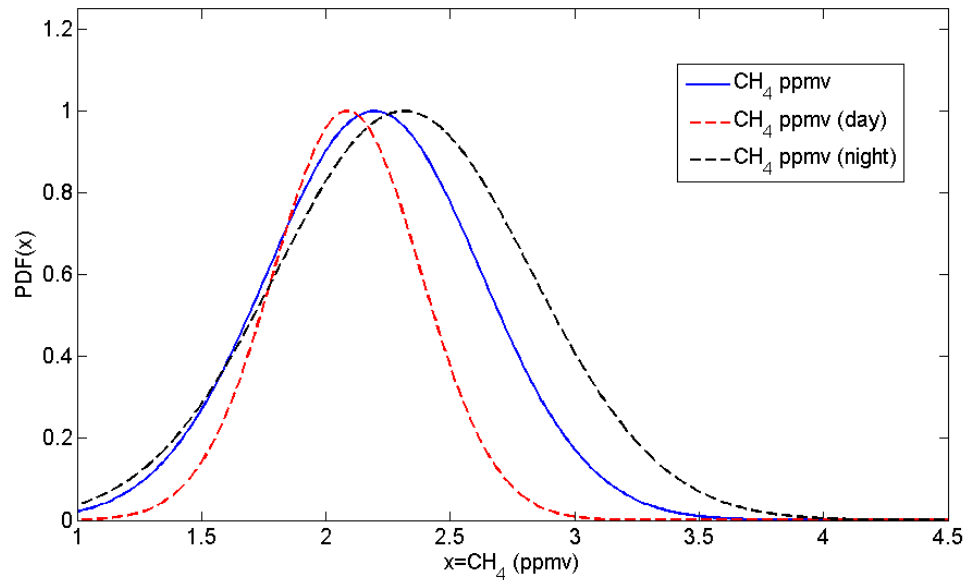
- **Halliday (with A. Wisthaler et al):** VOCs from ground and P-3 PT-RMS – benzene focus – **Monday talk**
- **Thompson et al:** Day-night trace gas patterns (Methane & other gases) at Platteville, CO -- **Tues talk**
- **Kollonige et al:** CH₄ (total column) comparisons of ground FTS (Hannigan/FRAPPE), aircraft, and satellites (TES) – **Thurs Poster**
- **Fasnacht et al:** Analysis of Stratospheric intrusions (SI) from sondes and aircraft throughout the DISCOVER-AQ campaign - **Thurs Poster**

Distinct Day-night Trace Gas Patterns at Platteville due to PBL Height Variability. Site in Drainage Valley

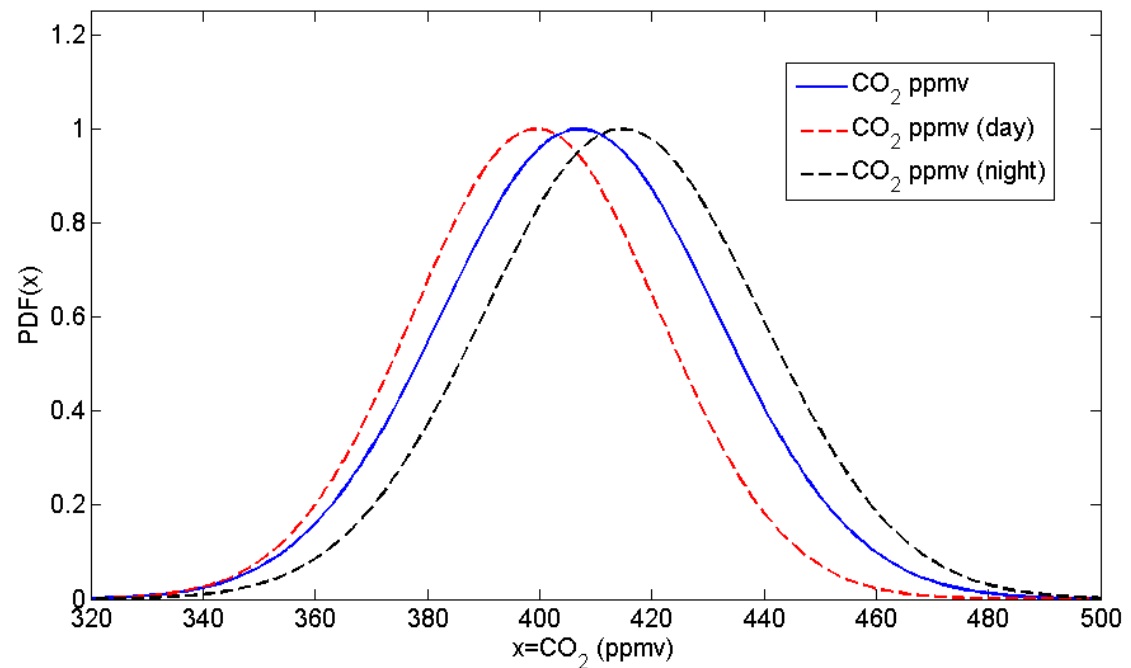


Halliday: Compares MPL PBLH (Hoff) & 40+ Sondes PBLH. Good agreement

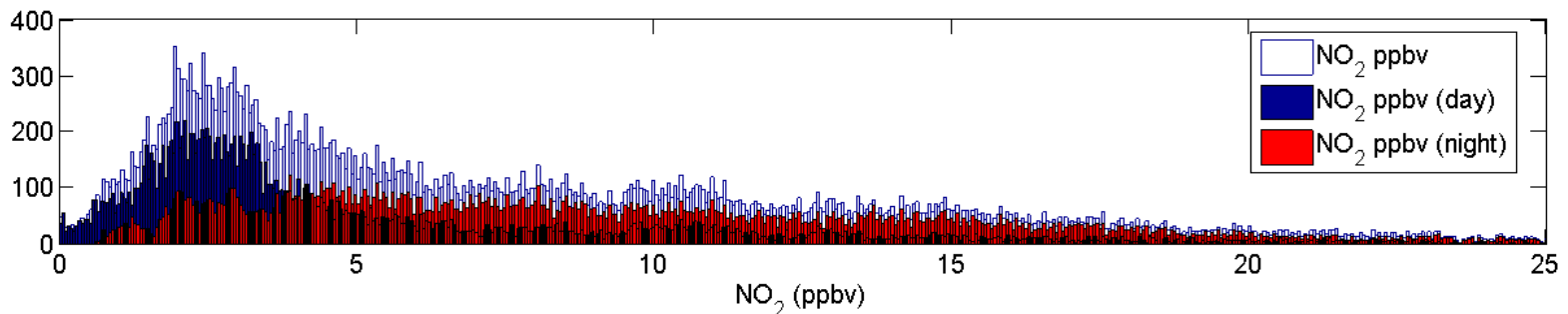
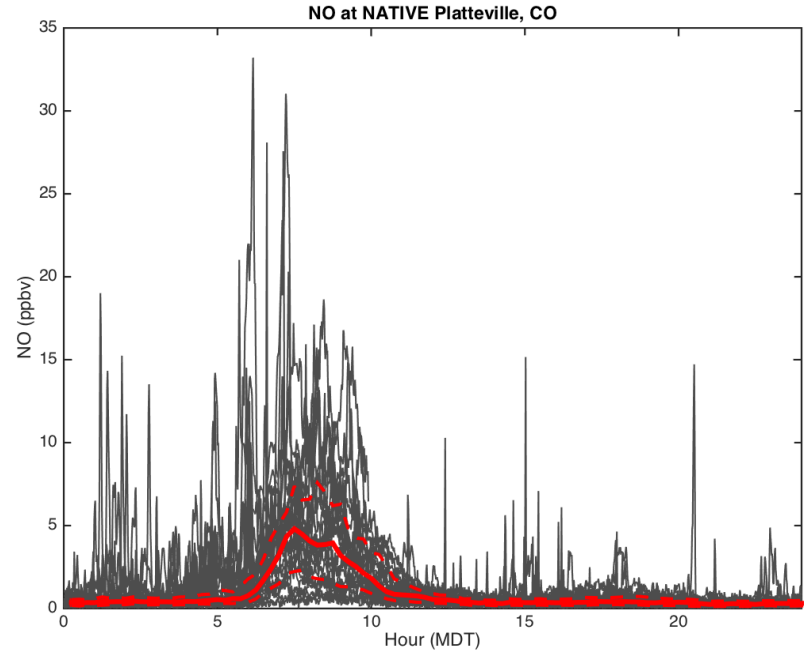
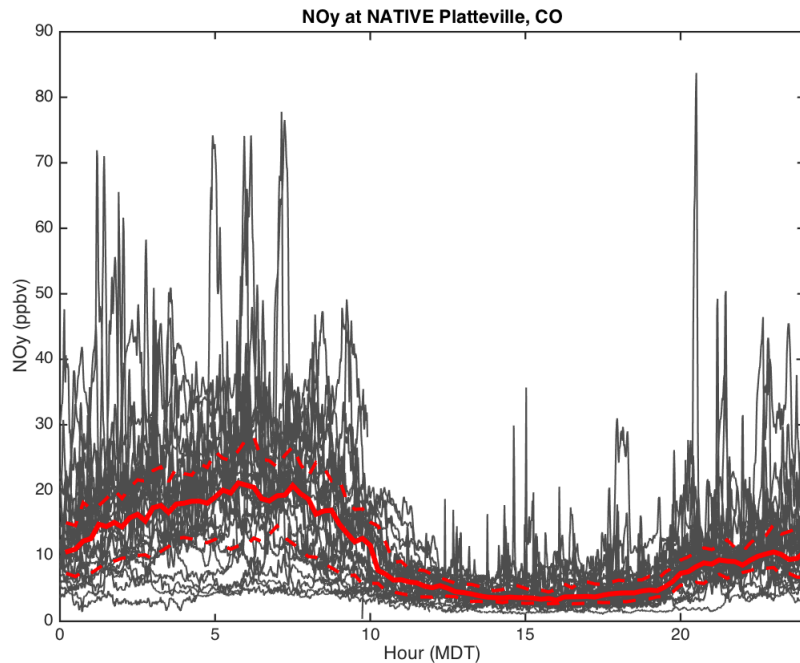
Day-night Distributions Based on Normalized Fit to Day vs Night



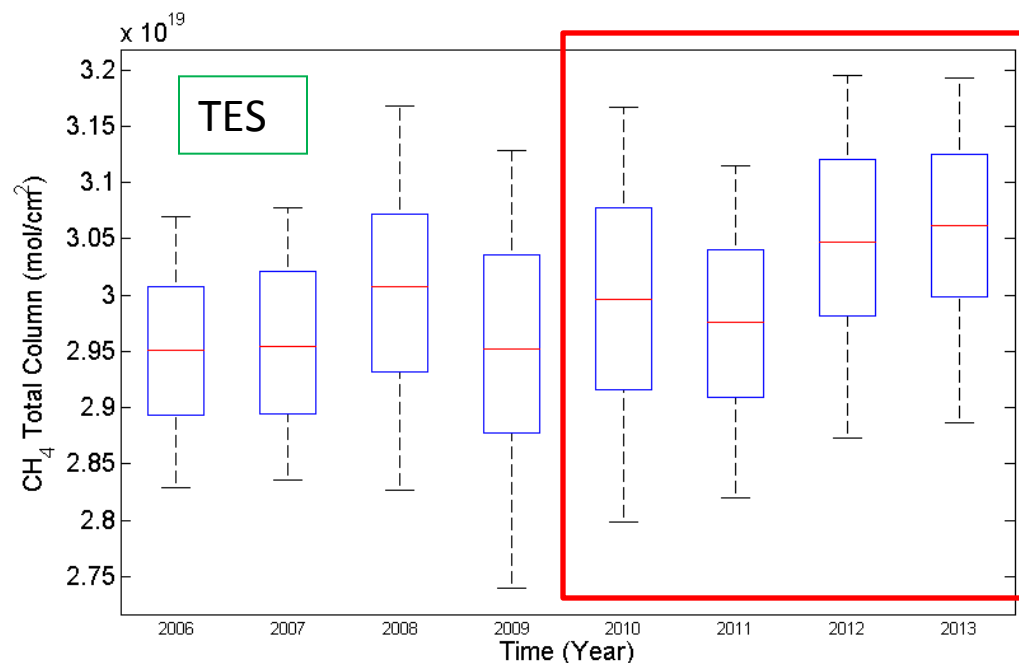
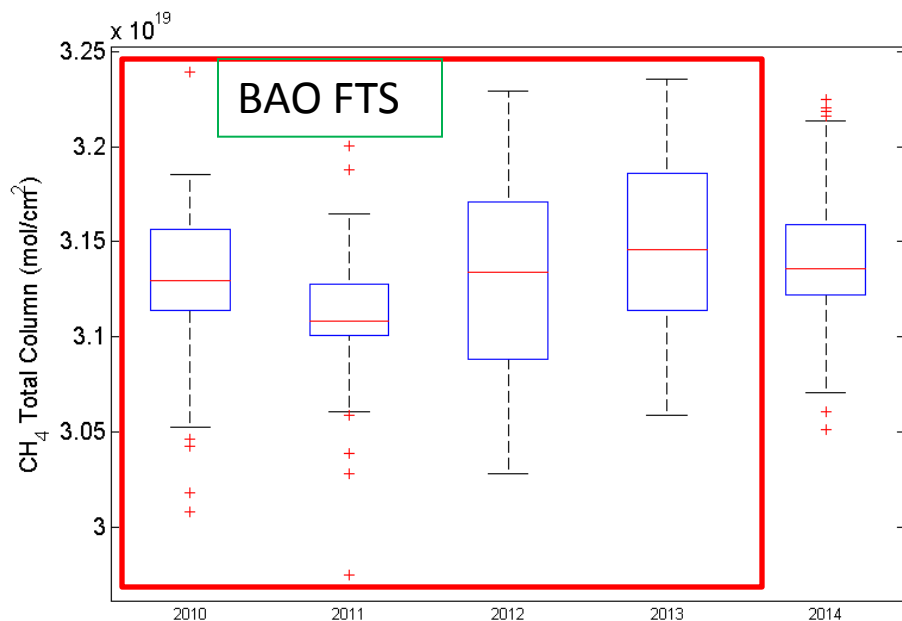
- Larger variability during nighttime measurements of CH_4 versus CO_2



Distinct Day-Night Trace Gas NO_y at Platteville. Compare NO_2 (Szykman Environ-SA) – Binned by 0.5 ppbv

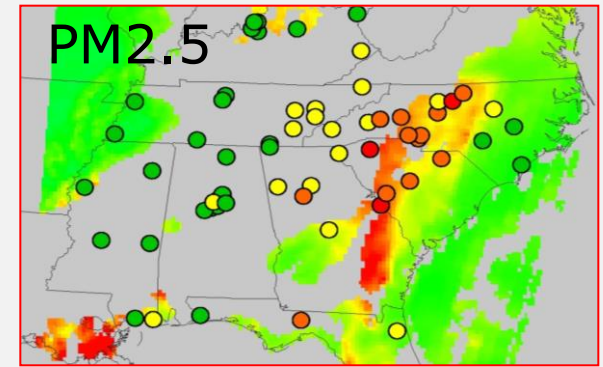
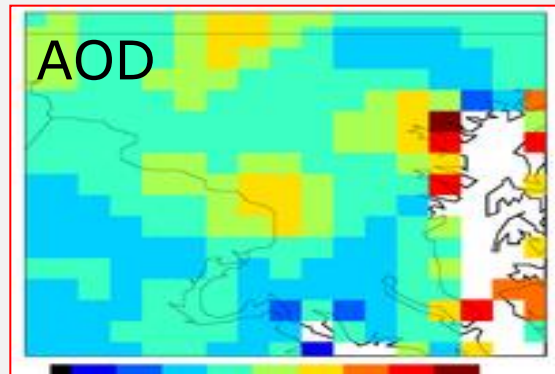


Total Column Methane at Boulder Atmospheric Observatory from Ground FTS and TES



- FTS Total Column Abundances for CH₄, HCHO, and O₃ have increased since 2011 at BAO (Hannigan/FRAPPE).
- Do satellites see similar pattern?
- Preliminary comparisons show similar increase in total column CH₄ from 2011 (since 2009 for TES instrument) at BAO.
- Column comparisons of CH₄ between aircraft, ground FTS, and satellite will be shown at upcoming meeting for Colorado campaign (and other DAQ campaigns).

BAO FTS Data courtesy of Jim Hannigan



Urban Aerosol Retrieval in MODIS Dark Target Algorithm: Implications to Air Quality Monitoring

Pawan Gupta^{1,2}, Robert Levy², Shana Mattoo^{2,3}

¹GESTAR Universities Space Research Associations

²NASA Goddard Space Flight Center, Greenbelt, MD, USA

³SSAI

Collaborator: A. van Donkelaar, and R. Martin (Dalhousie University, Canada)

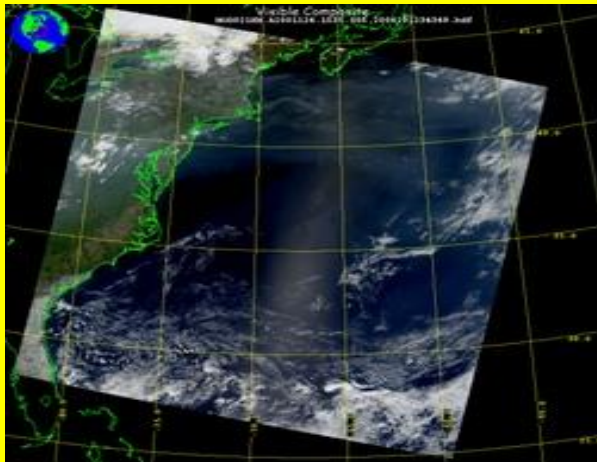
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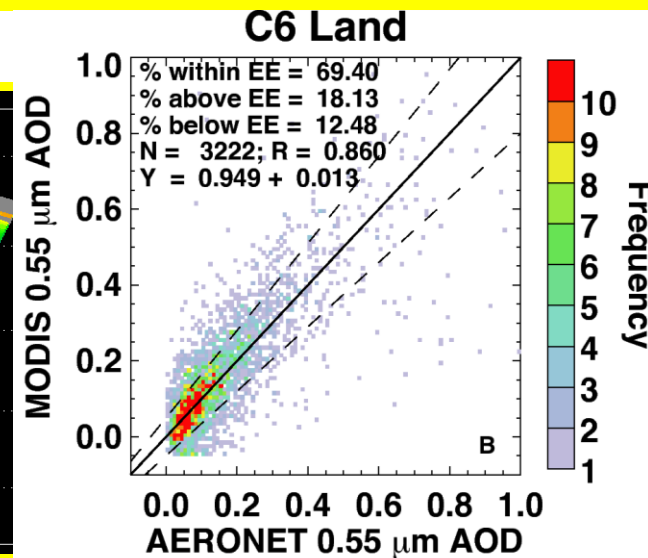
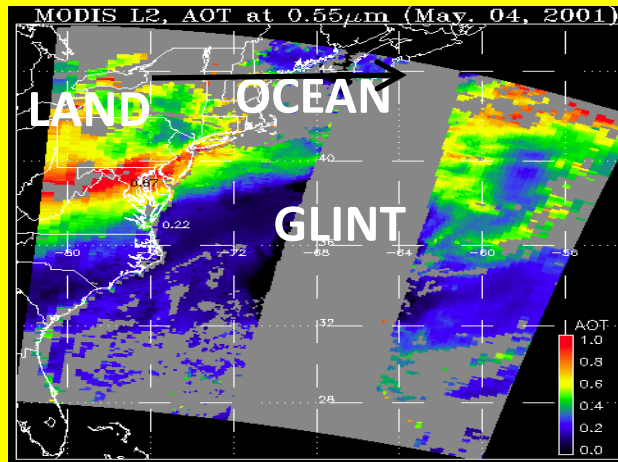
Global Aerosol retrieval from MODIS

Dark Target ("DT" ocean and land) Operational at 3 and 10 km

What MODIS Observes



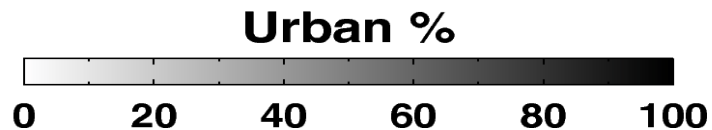
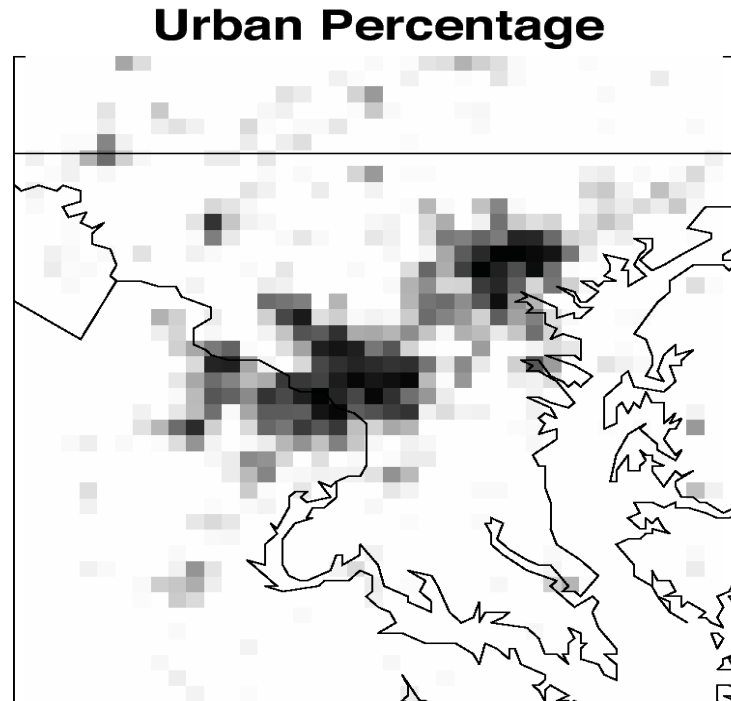
Attributed to aerosol



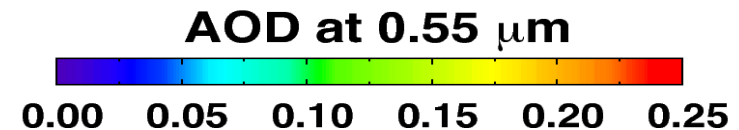
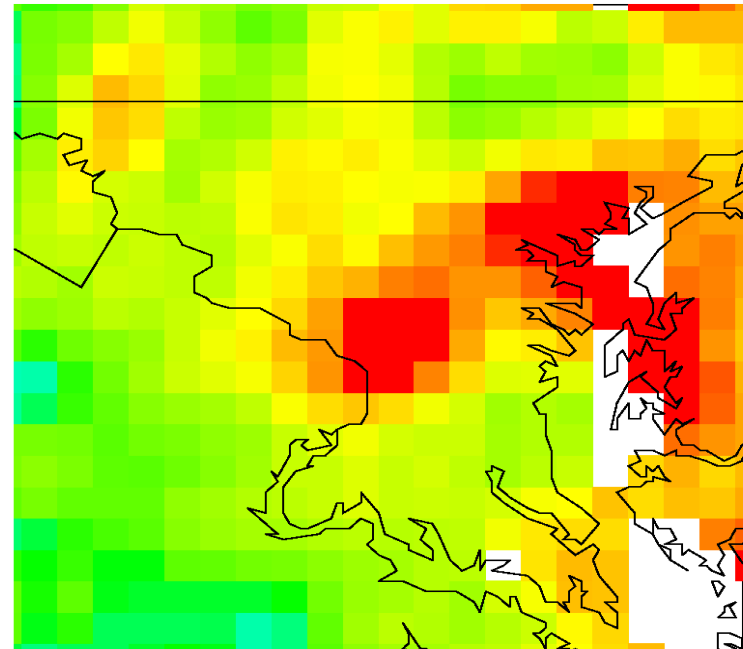
There are many other "algorithms" to retrieve aerosol from MODIS

City Center Appears as 'HOT SPOT' in MODIS DT AOD

Washington DC / Baltimore

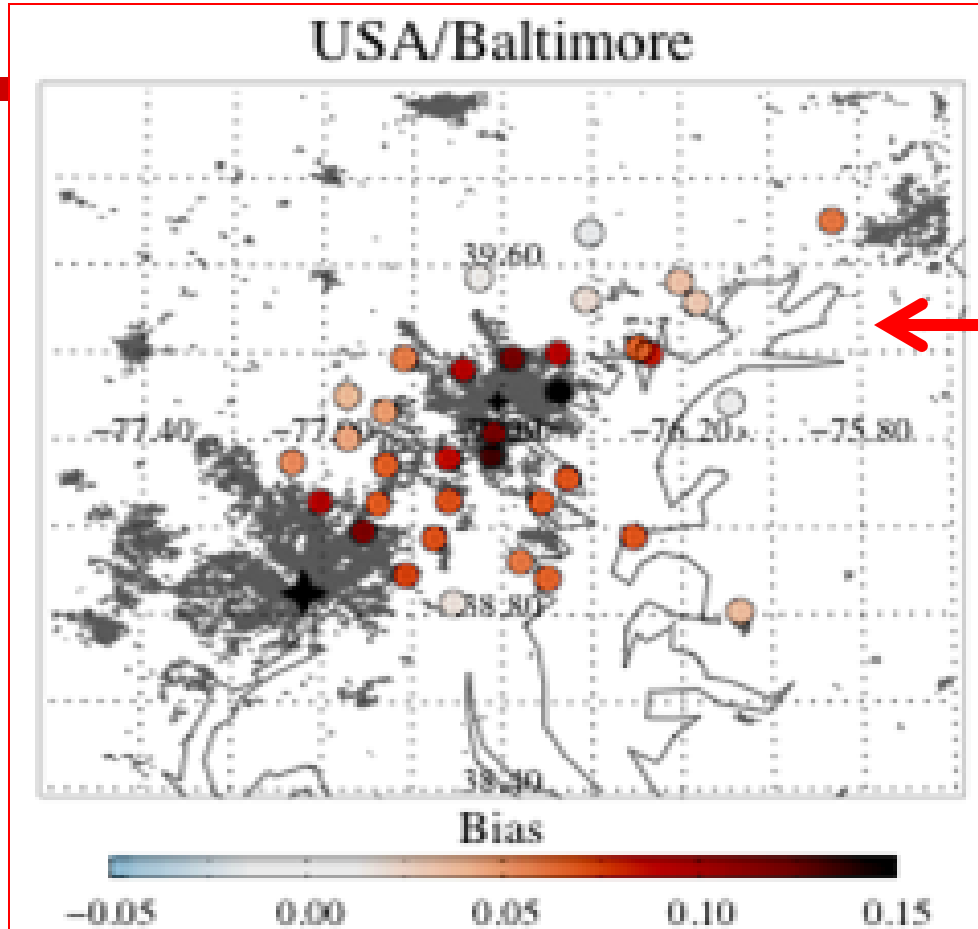


C6, DC/Baltimore, MAM 2010



Enhanced Aerosol optical depth at the city center

Urban Bias in DT AOD



Munchak et al., 2013

Mean bias (MODIS 3 km - AERONET) averaged over the campaign duration at each AERONET location

Many research studies have shown that this urban bias in AOD retrieval is most likely due to improper surface characterization in the DT retrieval algorithm.

Surface Characterization in MODIS Dark Target (MDT) Retrieval

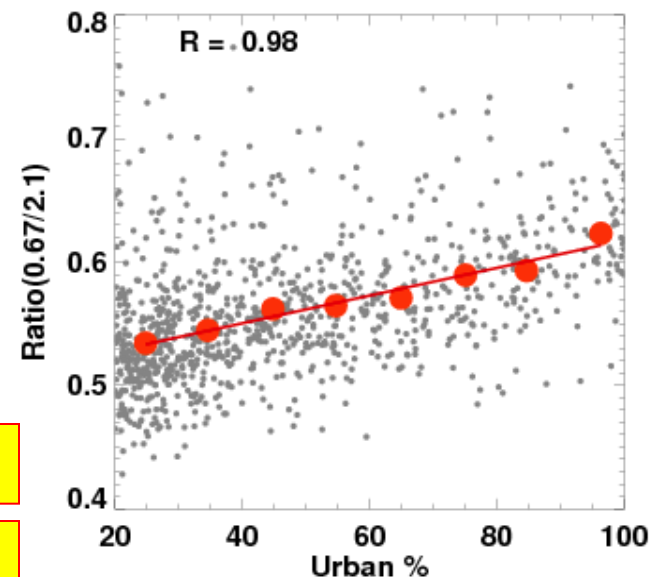
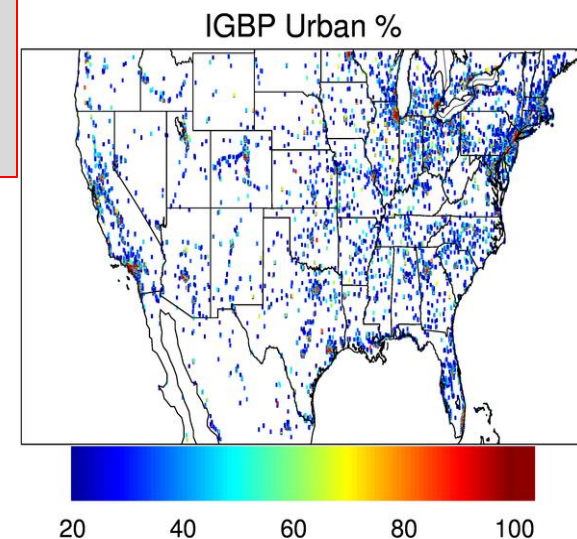
- Accurate surface characterization is very important in satellite AOD retrieval algorithm.

$$R_{VIS} = f(R_{SWIR}, \text{Angles}, NDVI_{SWIR})$$

- Over brighter and more variable surfaces (e.g. urban), the assumed VIS/SWIR relationship breaks down.

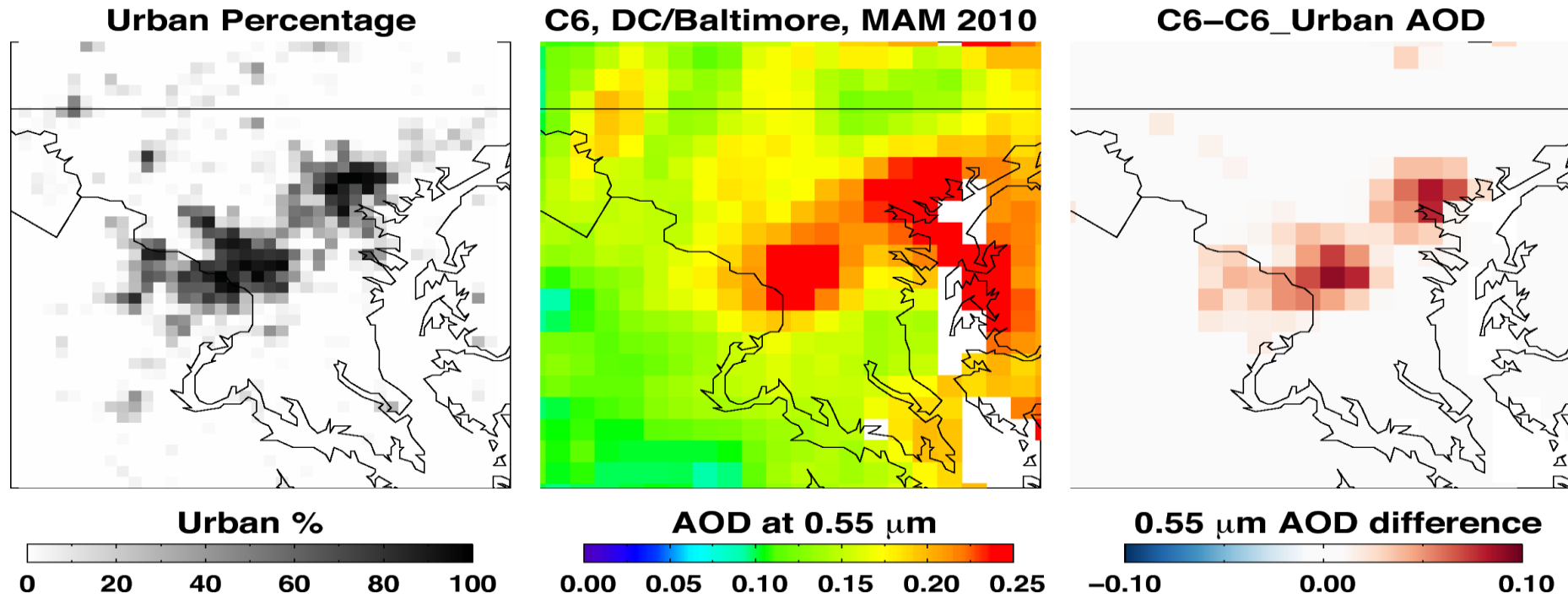
Revised Urban Surface Characterization

$$R_{VIS} = f(R_{SWIR}, \text{Angles}, NDVI_{SWIR}, \text{Urban}\%)$$



Aerosol Retrieval Improvements over Large Urban Corridors of Eastern USA Spring 2010

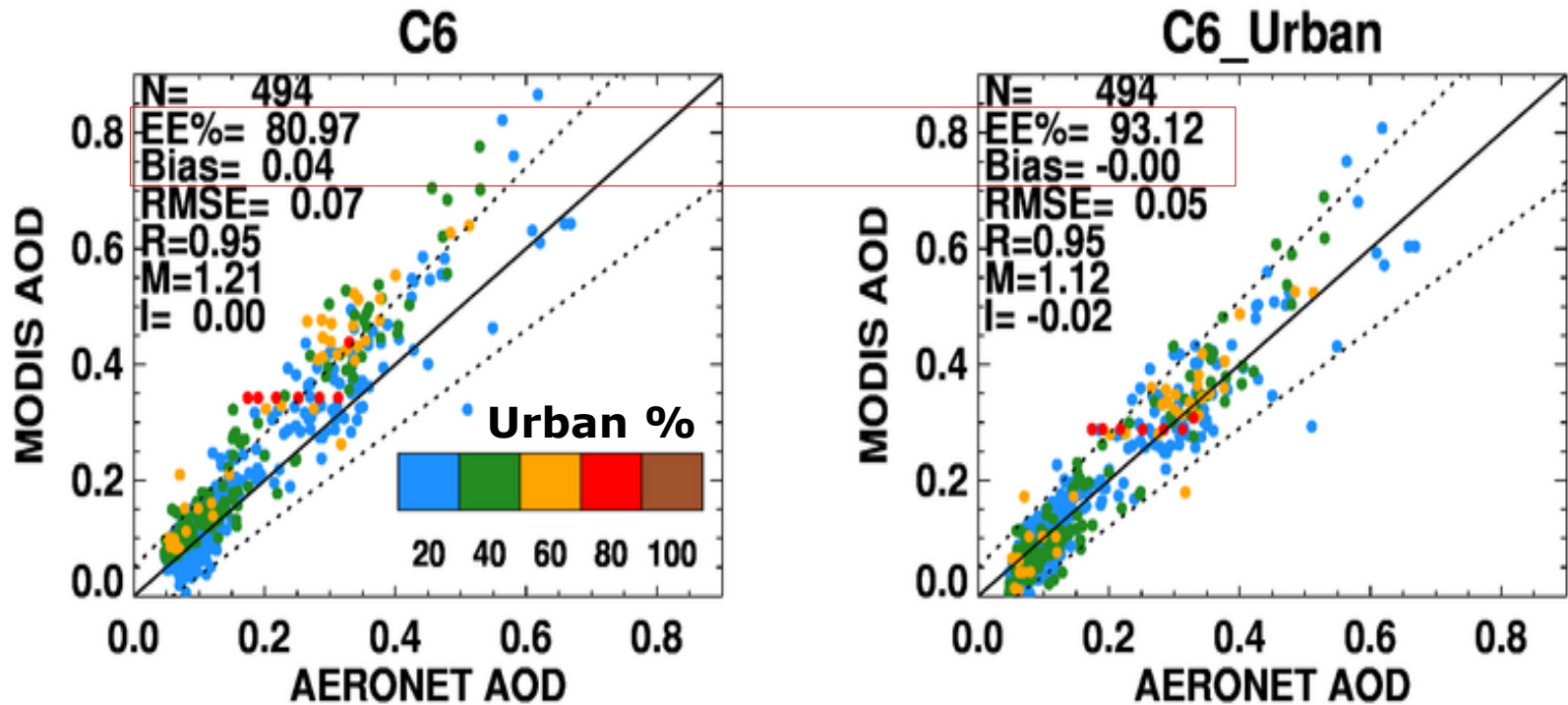
Washington DC / Baltimore



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(Baltimore-DC, July-August 2011)

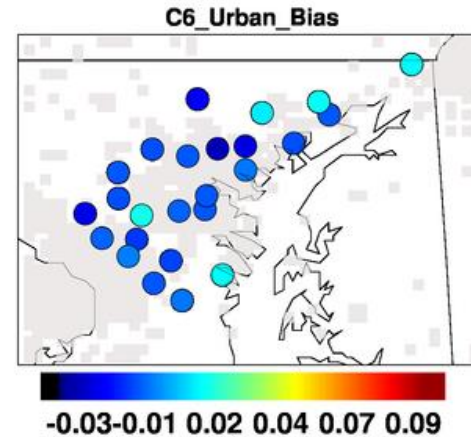
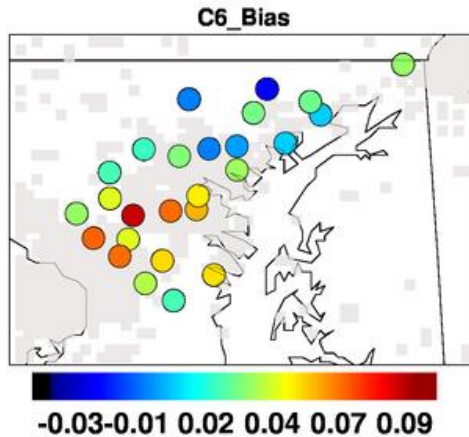


April 9, 2015

DISCOVER-AQ: DRAGON

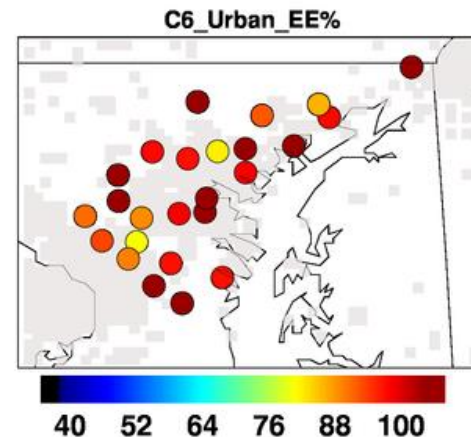
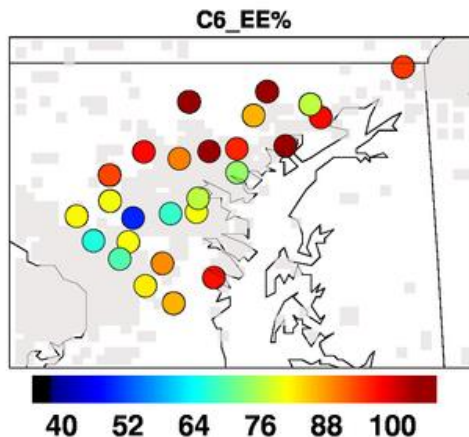
(Baltimore-DC, July-August 2011)

Mean Bias
w.r.t.
AERONET



*Significant
bias
reduction*

% of
retrievals
within
expected
error
($\pm 0.05 \pm 0.15 * \tau$)
w.r.t.
AERONET



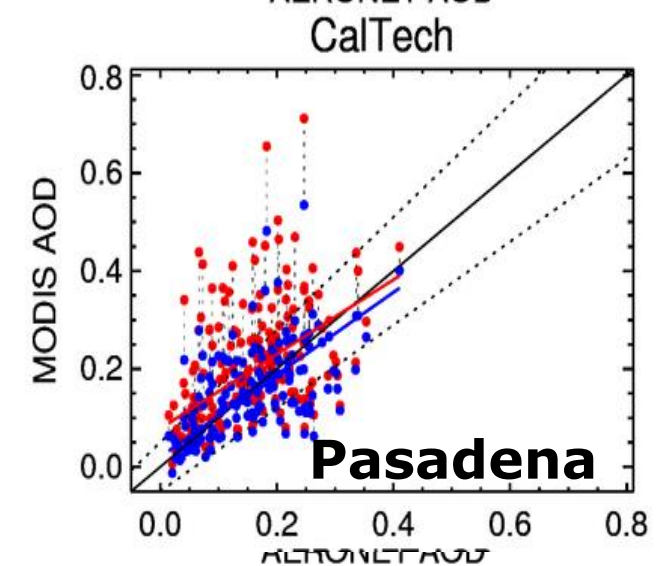
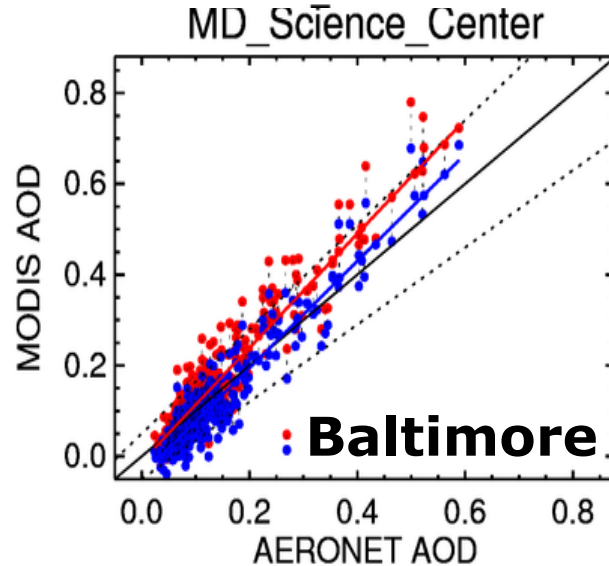
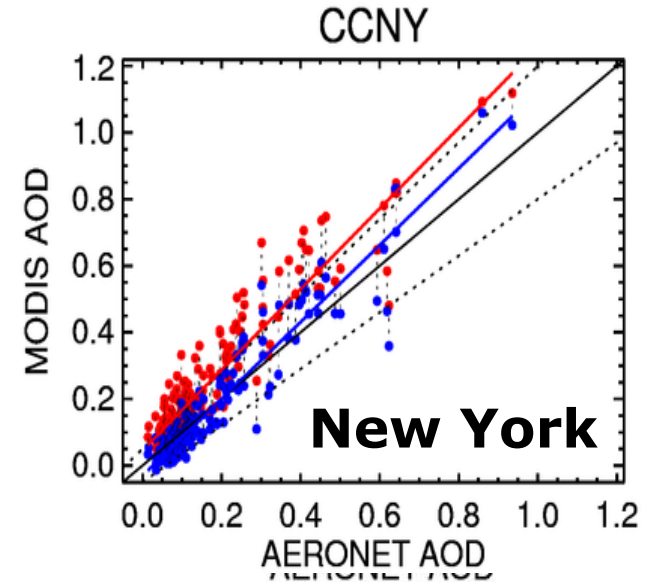
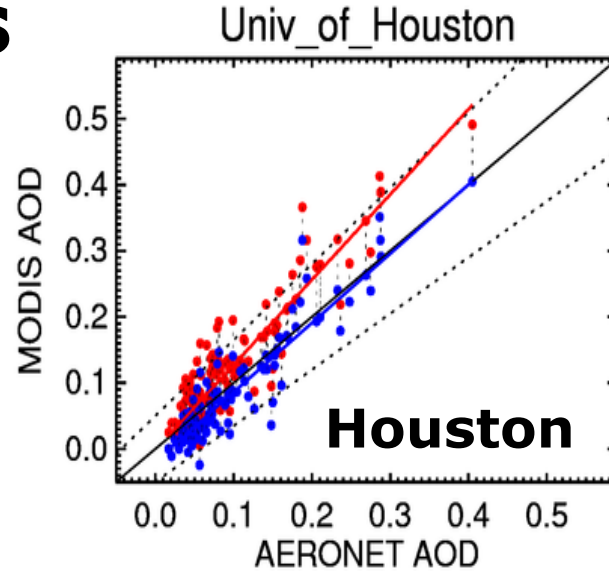
*Improved
number of
retrieval
within
uncertainty
envelope*

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Validation over U.S. Cities

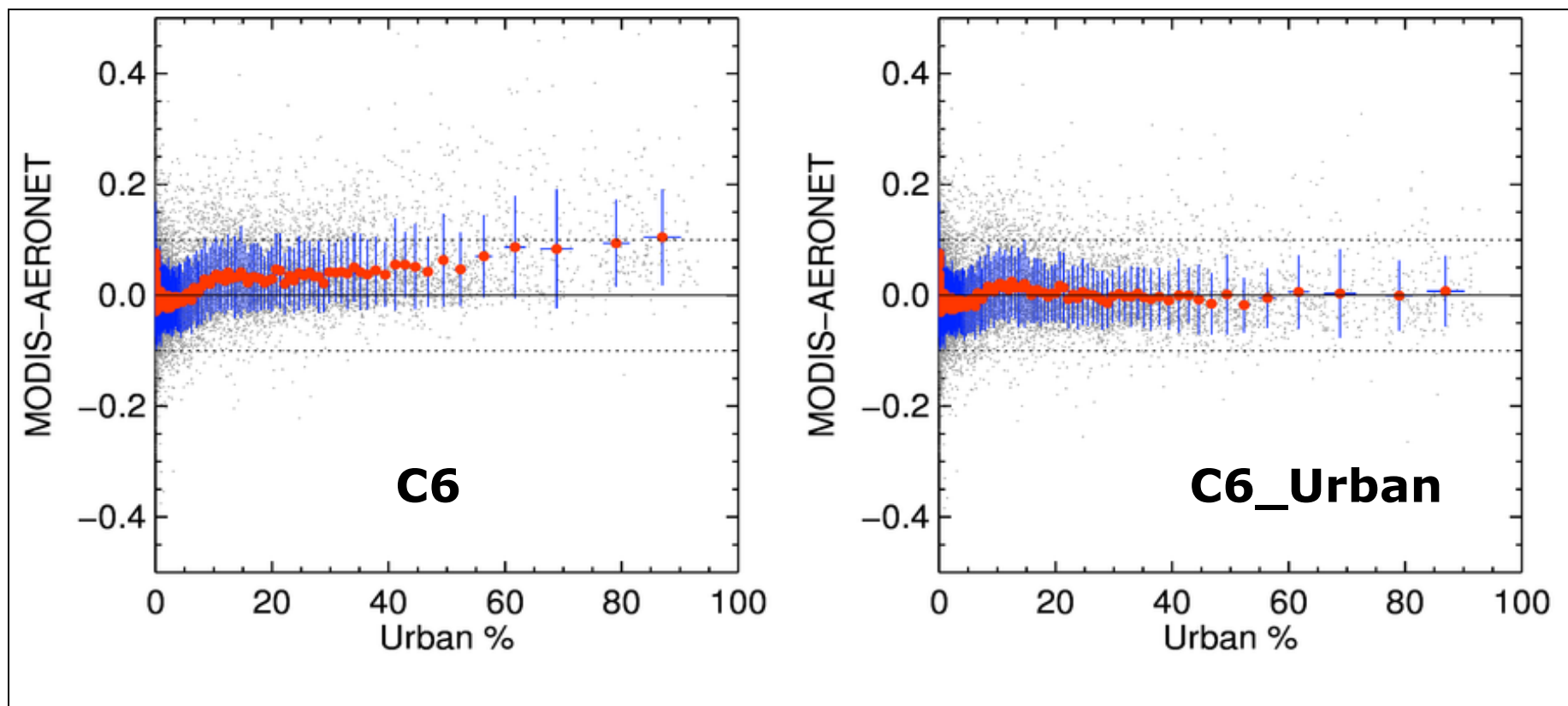
C6
C6_Urban



DISCOVER-AQ CALL

April 9, 2015

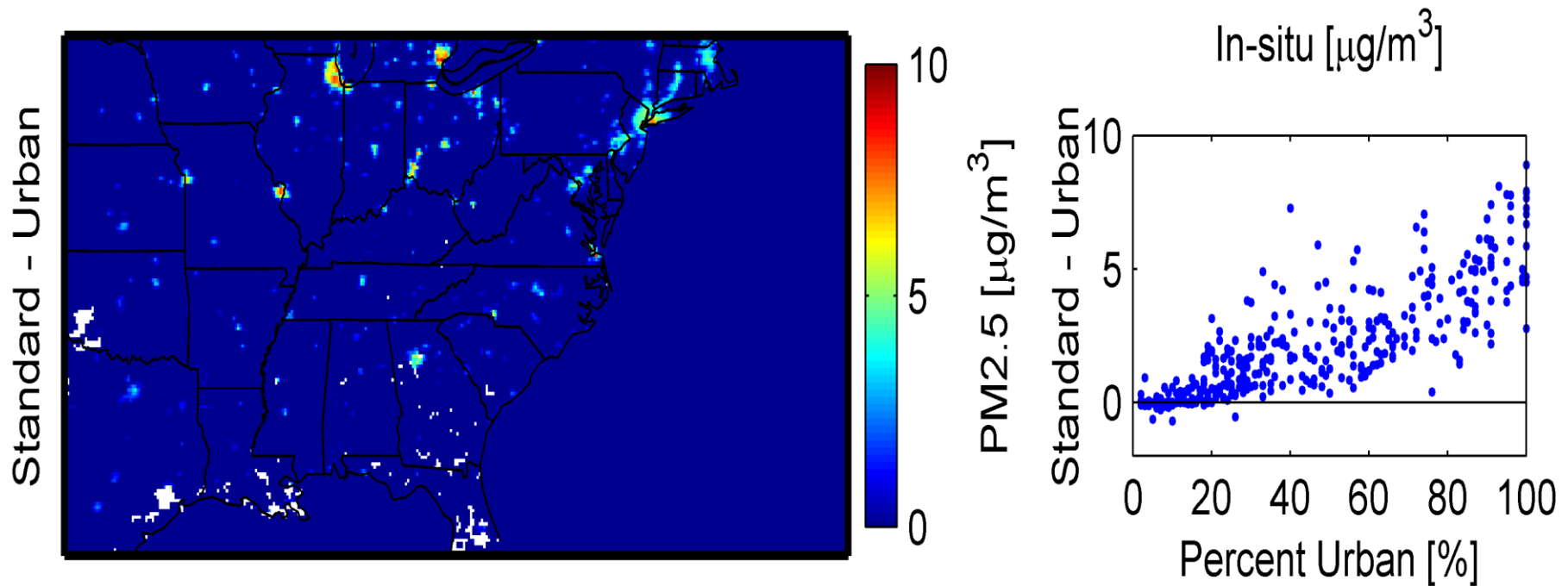
AOD Bias as Function of Urban %



DISCOVER-AQ CALL

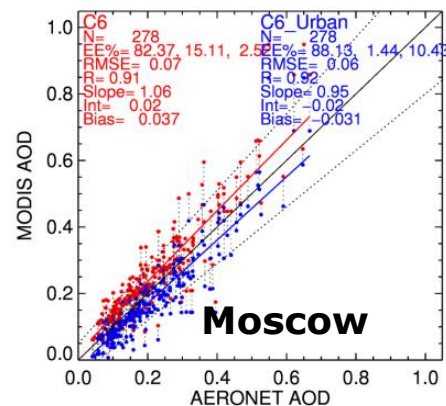
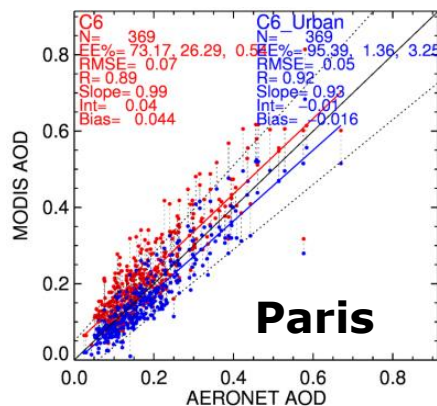
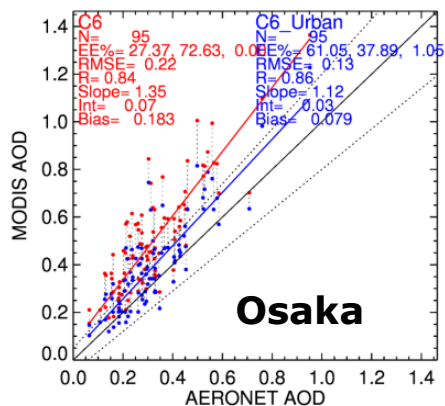
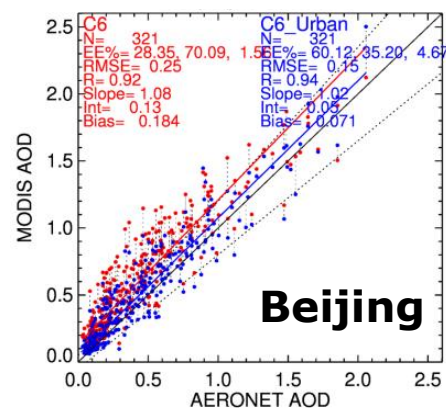
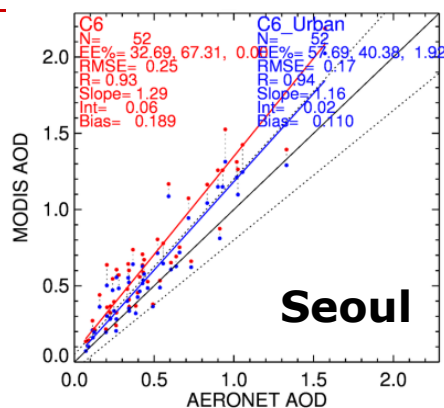
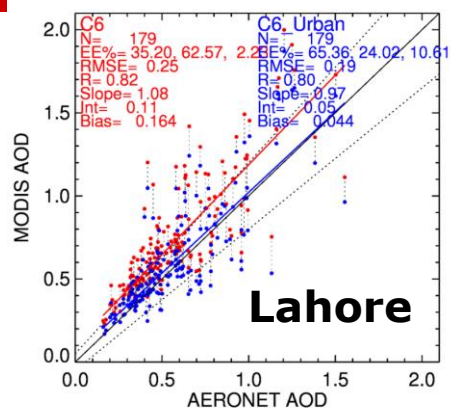
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Implication to Surface PM Air Quality



Significant differences in PM2.5 mass concentration over urban areas ($\sim 5\mu\text{g}/\text{m}^3$) were observed.

Global Implementation & Challenges



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Summary

- ✓ **Standard Dark-target aerosol retrievals (AOD) are biased high over urban areas.**
- ✓ **MODIS land surface reflectance and land cover classification data sets have been used to define a VIS/SWIR surface reflectance relationship that replaces standard DT assumptions over urban surfaces (urban percentage > 20%).**
- ✓ **AOD is reduced over urban areas, which reduces the high bias as compared to AERONET observations**
- ✓ **Urban algorithm works well in the US but global implementation will require more research and testing**

Ongoing/Future Work

- ❑ **Evaluate the urban surface relationship over global cities.**
- ❑ **Implement into the Operational MODIS Dark Target Land algorithm?**
- ❑ **Explore impacts of new AOD retrieval on regional and global studies of air quality, PM_{2.5} and health**

Draft percentiles analysis for 2014 campaign period

Patrick Reddy, CDPHE, March 12, 2015

(O3 increases with heights, temperatures; decreases with zonal wind speed)

Year11	DEN July-August 500 mb heights percentile	DEN July-August 700 mb temperature percentile	DEN July-August 700 mb zonal wind speed percentile	NREL July 17 – August 18 Mean MDA8 O3 percentile
1995	21	53	95	32
1996	37	26	53	84
1997	26	16	84	0
1998	84	32	32	53
1999	47	21	74	16
2000	79	89	53	95
2001	74	68	47	58
2002	58	74	26	63
2003	100	100	37	100
2004	0	0	68	11
2005	42	58	42	26
2006	53	37	11	89
2007	89	84	21	79
2008	11	63	5	37
2009	5	11	100	5
2010	16	42	89	42
2011	68	95	79	68
2012	95	79	16	74
2013	63	47	0	47
2014	32	5	63	21

